REMARKS

1. Power of Attorney

Please note from the enclosed Power of Attorney and Change of Correspondence Address document that the Applicant has transferred power of attorney to the undersigned attorney and firm. *Please take note of the new correspondence address.*

2. The Amendments and the Support Therefor

Sixteen claims (77-92) have been canceled (wherein claims 77, 85, and 91 were independent claims), eleven new claims (93-103) have been added (wherein claims 93-94 are independent claims), and no claims have been amended. No new matter has been added by the new claims, which generally find support in the prior claims 65-76, and also in (for example) FIGS. 3a-3b and page 12 line 11 onward of the application. More specifically, apart from the foregoing drawings and passages of the specification:

- claims 93-94 find basis in claim 65;
- claims 95-97 find basis in claims 68 and 75;
- claim 98 finds basis in claims 69 and 71;
- claim 99 finds basis in claim 66;
- claims 100 and 101 find basis in claim 73;
- claim 102 finds basis in claims 67, 70, 72, 74, and 76; and
- claim 103 finds basis in FIGS. 3a and 3b.

Further comments regarding the new claims are set out below at Section 5.

3. Sections 3-4 of the Office Action: Rejection of Claims 65-72 under 35 USC §102 in view of U.S. Patent 3,416,823 to *Auer*

Auer describes a pre-stressed nut which has an inside diameter sized to slip over the outside threaded diameter of a bolt (see column 2 lines 53-57, column 1 lines 53-57). The nut is then heated so that the pre-stress is released, and the nut shrinks to engage to the threading of the bolt, with the nut thereafter being threadable and unthreadable on the bolt in the same manner as any other bolt. Note the following passages of *Auer*:

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More specifically, the holding element is a nut of specific material which is placed on a threaded bolt and which shrinks after heating, to be secured on the bolt.

According to the invention the holding element, preferably a nut, consists of known shrinkable material. Its inside diameter is initially somewhat larger than the outside diameter of the bolt, preferably a corresponding conventional screw. It is thus not initially screwed on the screw, but simply slidably fitted thereon. By the supply of heat, for example, by means of a blower, the holding element can be caused to shrink and be deformably fitted on the screw so that the nut can be subsequently unscrewed from the screw as any other nut.

The nut material is preferably a cross-linked polymer which has been expanded at elevated temperature and which was cooled in the expanded state. Such material will then undergo shrinkage upon subsequent heating.

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In summary, there has been shown herein a nut which is composed of material initially in a pre-stressed state so that when the nut is applied to a fastener and heated the nut will be caused to be shrunk on the fastener. Additionally, the nut can be caused to shrink in the axial direction to apply with the fastener a clamping force on the material to be joined.

The Office Action asserts that *Auer*'s male element 3 and female element 4 anticipate claims 65-72. To summarize this structure:

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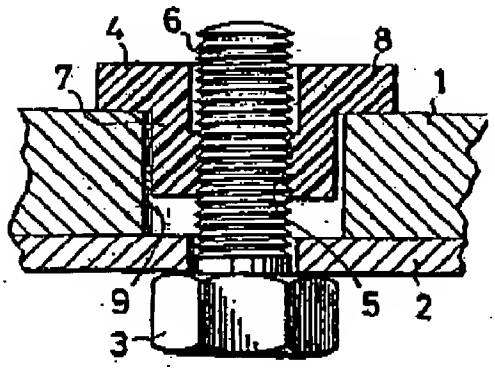
FIG. 1



In the construction shown in FIG. 1, two plates 1 and 2 are held together by means of a screw 3 and a nut 4 designed according to the invention. The nut 4 extends into a large bore 9 of the plate 1. The bore 5 of the nut is shrunk on the threads 6 of the screw 3, but initially the bore is smooth before shrinkage. Its inside diameter is initially somewhat larger than the outside diameter of the screw thread. A web 7 connects a flange or collar 8 with that portion containing the bore 5 which is shrunk on the thread. When the nut is placed on the bolt and heated, the nut contracts radially and axially and engages not only the threads 6, but compresses at the same time the plates 1, 2.

Kindly reconsider these rejections of claims 65-72. Regarding claim 65, initially note that *Auer* does not describe the use of a shape memory material (as such term is commonly known in the art): it does not describe a material which reversibly "remembers" different shapes at different temperatures (or other states), and rather it merely describes a prestressed nut which shrinks when heated to release preloaded stress, and which cannot "remember" its expanded form thereafter (even if heated or cooled). *Auer*'s shrinkage is irreversible. Such an arrangement does not agree with the definition of a shape memory material, as these terms are commonly used. See, for example, the AllRefer Encyclopedia at http://reference.allrefer.com/encyclopedia/S/shapememo.html:

> shape memory, Metallurgy And Mining: Terms And Concepts
> shape memory, property possessed by certain alloys that allows them to return, when heated, to their original shape after having been deformed. This effect results because, as the alloy is deformed, it undergoes a martensitic (or athermal) transformation: a solid-state transition that rapidly changes the crystalline structure of the alloy without thermal activation that is readily reversed once an appropriate amount of heat is applied.

A search for "shape memory" in the USPTO's own patent database yields many references showing that "shape memory" materials are understood to have certain shapes at certain temperatures, whereby shapes can be *reversibly* attained by heating and cooling. See, e.g., United States Patent 6,790,173 at column 11 lines 6-9 ("The shape memory alloy may be activated to adopt a preformed shape when exposed to body temperature, and returned to a contracted state by flushing overtube 22 with cold water or air"); United States Patent 6,764,120 at column 1 lines 15-25:

> The shape memory resin returns to an initial configuration at a temperature higher than a glass transition temperature (normally, a constant temperature about 20 to 60C, and in the case of a material holding implement to be used at a normal temperature, the shape memory resin to be used is of a glass transition temperature about 50 to 60C) and is freely deformable into a desirable material holding configuration, and at a temperature lower than the glass transition temperature the material holding configuration is fixed to form a material holding region.

See also U.S. Patent 5,536,126 to *Gross* at column 4 lines 29-33). In other words, shape memory materials adopt one shape when changed to one temperature, and return to their prior shape when returned to the prior temperature. Because *Auer* does not describe such a reversible change in

shape, whereby it can return to its original shape if reheated, *Auer* does not show use of a shape memory material within the meaning of the claims.

Auer also does not describe or suggest the arrangement of claim 65 wherein the cross-sectional *shape* of the first engagement region changes upon shape transition. The *size* of *Auer*'s engagement region (i.e., the nut bore) may change, but its *shape* does not: it remains round both before and after transition.

Further, note that *Auer* does not describe an arrangement wherein the female element grips the male element and then radially releases it upon shape transition. Rather, *Auer* describes the *opposite* arrangement, wherein its female element is disengaged from the male element and is then heated to engage it.

Claims 66–72, dependent from claim 65, are submitted to be allowable for at least the same reasons as claim 65. Also note that claim 68 further recites that the cross-sectional shape of the female element's engagement region changes from *oval to round*; *Auer* nowhere describes or suggests this arrangement since it always has a round engagement region. It appears that the Office Action is interpreting the "generally oval to generally round" language of claim 68 to mean "generally round to generally round" – an interpretation which may be broad, but which is in no way reasonable, since it totally discounts the "change the cross-sectional shape" language of claim 68, and also ignores the shape transition (oval-to-round) recited by the claim.

4. **Section 5 of the Office Action: Rejection of Claims 65 and 73-76 under 35 USC §102 in view of U.S. Patent 5,536,126 to *Gross***

Gross describes a shape memory helical coil locking fastener 46 resting within a helical groove 45 on the male element 44, and being affixed to the male element 44 by a spot weld 48 (column 3 lines 20-32 and 44-63). The male element 44 (with the helical fastener 46 affixed thereon) is then inserted in a bore 42 of article 40, and the male element 44 and helical fastener 46 are heated (or allowed to warm to ambient temperature) so that the helical fastener 46 expands and engages the male element 44 to the female bore 42 in article 40:

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During assembly, the helical fastener 46 may be deformed to lie within the helical groove 45, if provided, and one end or one intermediate location of the helical fastener 46 is fixed to the article 44, as with the spot weld 48. FIG. 4 shows the assembly at this point of the procedure. There remains a small clearance 50 between the locking fastener 46 and the bore 42.

Once assembled, locking fastener 46, and, where cooled, the first article 40 and second article 44, are heated to a temperature above the transformation temperature, numeral 28. The temperature to which the articles and fastener are heated is typically the service temperature, such as ambient temperature. The locking fastener 46 changes shape back towards the second shape as the transformation temperature is exceeded. The clearance 50 disappears, and the locking fastener 46 locks the second article 44 to the bore 42 of the first article 40. The first shape is selected to most securely lock the articles together.

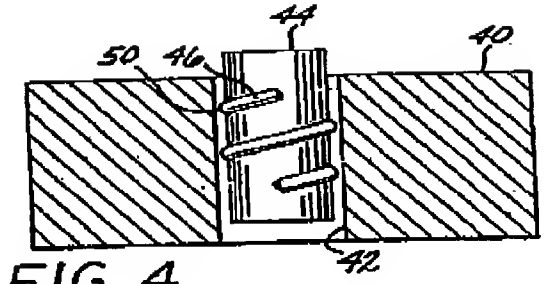

FIG. 4

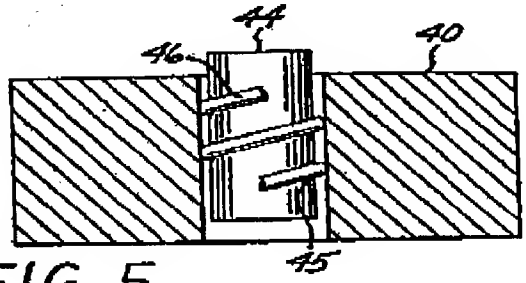

FIG. 5

Gross does not anticipate or suggest the invention recited in claim 65 because if the female element is regarded as article 40, as asserted by the Office Action, the female element has neither a first nor a second threaded engagement region provided thereon, as required by claim 65: the female bore 42 in article 40 is plainly totally smooth, and there is no "threaded engagement region of the female element [which] radially grips the threaded engagement region of the male element". Further, if the female element is regarded as the internal bore of the helical fastener 46, the shape transition of *Gross*' helical fastener 46 does not "release the threaded engagement between the male and female elements and leave the male element free to withdraw from the female element without having to be unscrewed therefrom," since *Gross*' helical fastener 46 is constrained/affixed to *Gross*' male element 44 at all times by the spot weld 48, the helical groove 45, and/or by other means (note column 3 lines 50-60). The helical fastener 46 does not (and is not intended to) clear or be removed from the male element 44, since it is the structure whereby *Gross*' male element 44 is affixed within the article 40.

Claims 73-76, dependent from claim 65, are submitted to be allowable for at least the same reasons as claim 65. Also note that claim 75 further recites that the cross-sectional shape of the shank changes from *oval to round*; *Gross* nowhere describes or suggests this arrangement since it always has a round engagement region regardless of its size.

5. **New Claims 93-103**

Claim 93 is submitted to be allowable for the same reasons noted for claim 65 above. Note that *Auer* changes size to contract and tighten the female engagement region of the nut about the male engagement region of the bolt. There is no suggestion that the opposite arrangement would be useful, particularly since it is unclear how one could practically create a nut which could expand in size to allow its removal from the nut without unscrewing. Similarly, *Gross* either has a female element 40 (the block/article) which is not formed of shape memory material and which does not expand, or it has a female member 46 (the coil) which does not remove from the male member, but remains thereon when changing shape.

Claim 94 is submitted to be allowable for generally the same reasons noted for claims 65 and 93. Claim 94 is not anticipated nor rendered obvious by *Auer*, since *Auer* cannot change from a tensioned form to a relaxed form (rather, it does only the opposite), and there is no suggestion to modify *Auer* to do otherwise, particularly since one purpose of *Auer* is to generate a clamping force on its plates 1 and 2 via shrinkage (as noted at column 2 lines 53-60). If *Auer* expanded rather than contracted, it could not generate any such clamping or urging force since the bolt would simply expand away from *Auer*'s plates. Claim 94 is also not anticipated by *Gross*, since the *Gross* female element is not formed of shape memory material (if the *Gross* female element is regarded to be the block/article 40), and/or the *Gross* male element is not freely withdrawable from the female element (if the female element is regarded to be the *Gross* helical fastener 46).

6. In Closing

If any questions regarding the application arise, please contact the undersigned attorney. Telephone calls related to this application are welcomed and encouraged. The Commissioner is authorized to charge any fees or credit any overpayments relating to this application to deposit account number 18-2055.

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